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Long-term Pension Forecasts

Investment Returns, Death Rates and Birth Rates

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Forecasting Quotes

- "It is difficult to make predictions, especially about the future."
 Danish Parliament 1937-38
- "There is no way that we can predict the weather six months ahead, beyond giving the seasonal average"
 - Stephen Hawking
- "Who needs theory when you have so much information? But this is categorically the wrong attitude to take toward forecasting, especially in a field like economics where the data is so noisy."
 - Nate Silver, The Signal and the Noise: Why So Many Predictions Fail—But Some Don't







Forecasting Quotes (continued)

- "There are two kinds of forecasters: those who don't know, and those who don't know they don't know."
 - John Kenneth Galbraith
- "There are known knowns, things we know that we know;
 And there are known unknowns, things that we know we don't know.
 But there are also unknown unknowns, things we do not know we don't know."
 - Donald Rumsfeld







Forecasting Encounters

- We often encounter forecasting
 - Hurricane season,
 - Hurricane paths and intensity (once they form),
 - Elections, earthquakes, and the weather this afternoon
- For the actuarial management of <u>insurance companies</u>:
 - Medical costs, car accidents, slip/falls, lawsuits
- For the actuarial management of <u>Social Security</u>:
 - Rates of birth, covered immigration, employment and death, covered earnings
- For the actuarial management of <u>pension plans</u>:
 - Future rates of inflation and investment returns (the most important actuarial assumptions)
 - Future rates of mortality, turnover, disability, retirement, salary increases, etc.





Forecasting Today's Agenda

- 1. Future investment returns of a pension portfolio
 - In pension actuarial valuations:
 - We project future benefit payments and salaries for each plan member
 - Then discount them back to present values using the portfolio's forecasted investment return
 - To calculate balance sheet liabilities, funded ratios and required contributions
- 2. Future death rates
 - Recent mortality rates and future improvements in morality rates
- 3. Future birth rates
 - Not for pensions, but useful for Social Security (and daycare, public schools)





Forecasting Future Investment Returns for Asset Pools

- Forecasting returns for <u>short-term cash management</u> involves:
 - Inflation rates
 - Interest rates
 - Yields
 - Credit quality
 - Duration
- Forecasting returns for <u>pension funds</u> involves:
 - Inflation rates
 - Asset allocations to numerous and diverse asset classes
 - Stocks&bonds, domestic&international, public&private markets, alternatives
 - Apply capital market assumptions for each asset class
 - Expected returns and cash flow demands over the mid-term (10 yrs) and long-term (20-30 yrs)
 - Goal is a reasonable best estimate; not overly optimistic





Sample Pension Fund Asset Allocations

	A Spectr	um of Sa	mple As	set Alloc	ations		
	М	ore Conserva	tive Portfolio		More Aggr	essive Portfo	lio
Risk/Fixed Assets	60/40	65/35	70/30	75/25	80/20	85/15	90/10
Large Cap Equity	35%	35%	30%	25%	20%	15%	15%
Sm/Md Cap Equity	15%	15%	15%	10%	10%	10%	10%
Developed Intl Equity	10%	10%	10%	10%	15%	15%	15%
Emerging Mkt Equity			5%	10%	10%	10%	15%
Real Estate		5%	5%	10%	10%	10%	10%
Private Equity			5%	10%	10%	15%	15%
Hedge Funds					5%	5%	5%
Other Alternatives						5%	5%
Total Risk-oriented	60%	65%	70%	75%	80 %	85%	90 %
Govt Fixed Income	20%	15%	10%	5%			
Corporate Fixed Income	15%	15%	10%	10%	10%	5%	
High Yield	5%	5%	10%	5%	5%	5%	5%
International Debt				5%	5%	5%	5%
Total Fixed Income	40%	35%	30%	25%	20%	15%	10%



Florida Pension Fund Asset Allocations



Source: Florida Department of Management Services Database (including <u>2023 valuation</u> data submissions rec'd through August 16, 2024; excluding plans having low asset values or high non-classified assets).

Number (and %) of Pension Funds with the given asset allocation.



Capital Market Assumptions (CMAs) – The Inputs

- Obtain the following from expert forecasting specialists, for each asset class:
 - Expected investment return for mid-term (10 years) and long-term time horizons (20-30 years)
 - Standard deviation
 - Correlation coefficient matrix across all asset classes

Participating Professional Investment Forecasters								
Aon/Hewitt	Blackrock	BNY/Mellon	Callan					
Cambridge	J.P. Morgan	Meketa	Mercer					
NEPC	Northern Trust	Verus	Wilshire					

Large, national, reputable, public sector experience, independent





Portfolios' Market-driven Expected Returns (2024)

50 ^{ti}	Percent	tile (50-5	0 Probal	oility of A	Achieving	g)			
BOY 2024	BOY 2024 Expected Compound Return Over Next 10 Years								
		More Conservative Portfolio More Aggressive Portfolio							
Investment Firms' Capital Market Assumpton Sets (CMAs)*	60/40	65/35	70/30	75/25	80/20	85/15	90/10		
1	4.38%	4.45%	5.07%	5. <mark>59%</mark>	5.66%	5.95%	6.14%		
2	5.37%	5.18%	5.72%	6.01%	6.22%	6.48%	6.56%		
3	5.39%	5.45%	5.89%	6.05%	6.35%	6.79%	6.94%		
4	5.71%	5.85%	6.38%	6.62%	6.59%	6.89%	6.96%		
5	5.82%	5.93%	6.41%	6.72%	6.80%	6.94%	7.04%		
6	5.82%	6.01%	6.41%	6.77%	6.80%	7.09%	7.25%		
7	6.14%	6.22%	6.62%	6.81%	6.92%	7.17%	7.28%		
8	6.18%	6.26%	6.67%	6.84%	6.92%	7.17%	7.29%		
9	6.41%	6.52%	6.78%	6.92%	7.03%	7.20%	7.29%		
10	6.50%	6.61%	7.06%	7.07%	7.11%	7.25%	7.39%		
11	6.55%	6.71%	7.12%	7.41%	7.42%	7.74%	7.89%		
12	6.70%	6.75%	7.18%	7.48%	7.61%	7.75%	7.95%		
2024 Consensus Average	5.91 %	5.99%	6.44%	6.69 %	6.78 %	7.04%	7.16%		

* Investment Firms' CMAs published for 2024. Investment Firms do not rank the same across all asset allocations. Some rank a little higher in some asset allocations than they do in others. Nevertheless, they are listed here from 1 through 12.

- Expected returns over next 10 years are driven in large part by the current market conditions
- Notice the <u>horizontal spread</u> from the most conservative portfolio (60/40) to the most aggressive (90/10)
- Notice the <u>vertical spread</u> from the most conservative forecaster (#1) to the most optimistic (#12)



Florida Pension Fund Return Assumptions Adopted



Source: Florida Department of Management Services Database (including 2023 valuation data submissions rec'd through August 16, 2024; excluding plans having low asset values or high non-classified assets).

Number (and %) of Pension Boards with the given return assumption.



• Shift back to 2023 again . . .

Florida Pension Return Assumptions vs. Asset Allocations

	A	Amor	ng 362	Stmer Loca	l Flori	ida Pl	Actu ans (2	al Ass 2023 V	aluati	ocatio ons)	on	
		Actual Asset Allocation (Rounded to Nearest 5%)										
		<60%	60/40	65/35	70/30	75/25	80/20	85/15	90/10	>90%	Plans	
E	>8.00%	-	-	-	-	-	-	1	-	-	1	
® tur	8.00%		-	-	-	-	-	-	1	-	1	
25°	7.75%	-	2	1	-	2	1	-	-	-	6	
ent st 0	7.50%	-	3	7	12	20	7	2	1	-	52	
are	7.25%	1	4	7	14	27	13	3	1	-	70	
Re	7.00%	-	9	9	31	32	17	6	-	1	105	
a b	6.75%	2	7	8	17	14	11	3	1	1	64	
ed	6.50%	-	2	2	11	7	7	-	-	-	29	
	6.25%	3	2	1	2	2	4	-	-	1	15	
SSI R	6.00%	1	1	1	2	2	-	2	-	1	10	
<	<6.00%	6	1	-	-	2	-	-	-	-	9	
Tota	l Plans	13	31	36	89	108	60	17	4	4	362	
	Number of Plans, Source: Florida Department of Management Services Database (2023 valuation data submissions rec'd											

thru August 16, 2024; excluding plans having low asset values or high non-classified assets).

- 2023 actuarial valuation assumptions
- 2023 actual asset allocations
- For a more aggressive risk profile we should <u>expect</u> a higher future return
- For a more conservative risk profile we should <u>expect</u> a lower future return



Assessing Florida Return Assumptions

Comparison of Actuaries' Preferred 2023 Return Assumptions with Florida Local Pension Boards' 2023 Adopted Assumptions



Percent of 60 public sector pension actuaries (from many different firms around the country) preferring a given return assumption, as surveyed at the national Enrolled Actuaries Conference in May 2023.

Percent of 362 Local Florida Pension Boards adopting a given return assumption for 2023 actuarial valuations, as downloaded from Florida DMS database August 16, 2024.

- 60 public sector pension actuaries were surveyed in May 2023 (light blue)
- "What is your preferred total rate of return assumption?"
- Not what your clients adopt, but your "preferred" rate, regardless of asset allocation.
- Compared to 362 Florida plans adopted assumptions for 2023 (dark blue)
- Actuaries generally prefer lower assumptions in 2023 than Florida plans adopted for 2023



Assessing Florida Return Assumptions

Assumed Investment Return <u>x</u> Actual Asset Allocation Among 362 Local Florida Plans (2023 Valuations)

			Actual Asset Allocation (Rounded to Nearest 5%)								
		<60%	60/40	65/35	70/30	75/25	80/20	85/15	90/10	>90%	Plans
c	>8.00%	-	-	-	-	-	-	1	-	-	1
® tr	8.00%	-	-	-	-	-	-	-	1	-	1
25°	7.75%	-	2	1	-	2	1	-	-	-	6
ent st 0	7.50%	-	3	7	12	20	7	2	1	-	52
are	7.25%	1	4	7	14	27	13	3	1	-	70
Ne	7.00%	-	9	9	31	32	17	7.00%6	-	1	105
달 말	6.75%	2	7	8	17	14	6.75% 1	3	1	1	64
ed	6.50%	-	2	2	11	6.50%7	7	-	-	-	29
	6.25%	3	2	1	6.25%2	2	4	-	-	1	15
SS F	6.00%	1	1	1	2	2	-	2	-	1	10
<	<6.00%	5.25% 6	5.25%	5.75%	-	2	-	-	-	-	9
Tota	I Plans	13	31	36	89	108	60	17	4	4	362
	Number of	Diane Source	o: Elorido E)onartmont	of Manago	mont Sonio	oc Databar	o (2023 val	untion data	cubmiccio	ne rec'd

<u>Number of Plans.</u> Source: Florida Department of Management Services Database (2023 valuation data submissions rec'd thru August 16, 2024; excluding plans having low asset values or high non-classified assets).

- Expected compound return over a <u>benefit-weighted time</u> <u>horizon</u>
- <u>Consensus average</u> of market-driven expectations from <u>forecasting firms</u>;
- Then smoothed using a rolling <u>3-year average</u> to dampen volatility in market-driven expectations for a <u>more appropriate use in</u> <u>annual pension valuations</u>.
- Consider a "range of reasonableness" around these mid-points





- Liability for retirees today

 Sum of future benefit
 payments (shaded)
 discounted to today (bars)
- Benefits expected for each year are discounted using expected rate of return;
- Benefits paid in the future years are expected to gradually decrease due to mortality.





- 2. Timing is uncertain
 - Continues to evolve
 - Expectations keep changing

- 1. Probability of dying is 100%
- No change







Accrued Benefit CashFlows - 50% Higher Mortality

Does timing matter? – Scenario Testing

- Two scenarios tested:
 - Mortality rates multiplied by factor of 1.5
 - Mortality rates multiplied by factor of 0.5
- 50% higher mortality reduces total of benefits paid by 17% and liability by 11%
- 50% lower mortality increases total benefits paid by 35% and liability by 17%.







- 1. Improvements in survival over time varied by age group:
 - Dramatic improvements observed for children in early 20th century
 - Improvements during retirement ages continue through 20th century and into 21st century
- 2. Maximum life-span not increasing





Jeanne Calment enjoys her daily cigarette and glass of red wine on the occasion of her 117th birthday. Humans Could Live up to 150 Years, New Research Suggests | Scientific American Recent medical developments failed to increase the maximum life-span extensions.

Jeanne Calment <u>died in 1997</u> at the age of 122 and still holds the record for being the person with the longest life span.

Jiroemon Kimura died in 2012 at the age of 116.







A Measured Breath of Life



- 1. No consensus on whether future medical advances could result in increased maximum life-span.
- 2. Dr. Steven Austad (Alabama) is betting against Dr. Jay Olshansky (Chicago), that there will be someone at least 150 years of age by the year 2150 (implying that this person is already among us).





- 1. Improvements in survival over time varied by age group:
 - Dramatic improvements observed for children in early 20th century
 - Improvements during retirement ages continue through 20th century and into 21st century
- 2. Maximum life-span not increasing







Fertility Trends



Then ...





GRS



1970

1975



... and Now







Fertility rates and birth rates are related terms:

- Fertility rate measures the average number of children women have during their lifetime.
- Birth rate measures the number of live births per 1,000 people each year.





Fertility Trends



- 1. Fertility reached a peak of 3.7 in 1957
- 2. Most recently, the lowest rate of 1.64 was recorded for 2020

Social Security Administration Office of the Chief Actuary May 6, 2024



Fertility Trends



Chart 1.3: Historical and Projected Total Fertility Rates

- 1. Fertility rates are expected to slowly increase to 1.9
- 2. Demographers refer to the recent drop in the fertility rates as temporary "tempo effect" due to a delay in childbearing to older ages

https://www.ssa.gov/oact/TR/2024/2024_Long-Range_Demographic_Assumptions.pdf

Social Security Administration Office of the Chief Actuary May 6, 2024



Birth Rates



Chart 1.2: Central Birth Rates for Five Year Age Groups: Historical and Alternative II Projection

Social Security Administration Office of the Chief Actuary May 6, 2024

- In contemporary industrialized countries, birth is becoming a result of rational choice.
- Women and couples often plan future childbearing or postpone births until conditions are more favorable.
- It is expected that birth rates for traditional childbearing ages reached the bottom, but there is some pent up potential for higher age groups.



https://www.ssa.gov/oact/TR/2024/2024_Long-Range_Demographic_Assumptions.pdf

Death Counts

Rank	Flag	Country	Deaths Per Day ~	Deaths Per Hour	2024 Population
1	*])	China	31,974	1,332	1,419,321,278
2	۲	India	26,166	1,090	1,450,935,791
3		United States	8,341	48	345,426,571
1		Nigeria	7,416	309	232,679,478
5		Indonesia	5,917	247	283, <mark>487,931</mark>
6		Russia	5,100	212	144,820,423
7	C	Pakistan	4,434	185	251,269,164
2		Janan	4 217	176	123 753 0/1

Birth Counts

					₿ CSV ₿、
Rank	Flag	Country	Births Per Day ∽	Births Per Hour	2024 Population
1	۲	India	63,482	2,645	1,450,935,791
2	*]:	China	24,153	1,006	1,419,321,278
3		Nigeria	20,699	862	232,679 <mark>,4</mark> 78
4	C	Pakistan	18,858	786	251,269,164
5		Indonesia	12,234	<mark>51</mark> 0	283,487,9 <mark>31</mark>
6	*/	DR Congo	12,232	510	109,276,265
7		Ethiopia	11,378	474	132,059,767
8		United States	10 005	417	345 426 571

US population is growing at a decelerating rate.

Source: worldpopulationreview.com accessed 9/10/2024















The U.S. population is projected to reach a high of nearly 370 million in 2080 before edging downward to 366 million in 2100

- Under the high-immigration scenario, population increases every year and is projected to reach 435 million by 2100.
- Under the low-immigration scenario, population is projected to peak at around 346 million in 2043 and decline thereafter, dropping to 319 million in 2100.
- The zero-immigration scenario projects that population declines would start soon after 2024. The population in this scenario is projected to be 226 million in 2100.

(Press Release Number: CB23-189, November 09, 2023)







Aged dependency ratio = (population age 65 and older) / (population age 20 through 64).

The drop in birth rates after 1965 has caused a sharp increase in the aged dependency ratio between 2010 and 2040.



Demographic Summary

- Life expectancy continues to increase, but there is a limit,
- Fertility rates continue to decline, but are expected to stabilize above current levels,
- US population is growing, but is expected to start declining in 50-60 years,
- US society is aging and will to continue to age,
- Aged dependency ratio is increasing and is expected to continue to grow.
- We can't count on future generations to bail out our pensions, we need to prefund now.





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